DEPARTMENT OF PHYSICS & ASTRONOMY
TRENT UNIVERSITY

PHYS 2700H : THERMAL PHYSICS 2017 WI
Peterborough

Instructor: Patrick Clancy	**Trent Email:** jamespatrickclancy@trentu.ca	**Telephone:** (705) 748-1011, ext. 7155
Campus: Peterborough	**Office Location:** SC 322	**Office Hours:** To be determined by mutual agreement

Academic Administrative Assistant: Gina Collins	**Email:** gcollins@trentu.ca
Office Location: SC 327	**Telephone:** (705) 748-1011, ext. 7715

Teaching Assistant: Donovan Allum	**Email:** donovanallum@trentu.ca

Course Description: This course will provide an introduction to thermal physics and the subject of thermodynamics. Topics to be covered include: the laws of thermodynamics and their applications, thermodynamic potentials, the kinetic theory of gases, and the principles of statistical thermodynamics.

Course Pre-requisites: PHYS 1001H and 1002H (Introductory Physics I and II), PHYS 2610H (Introductory Quantum Physics) and MATH 2110H (Calculus III: Calculus of Several Variables).

Required Texts: Daniel V. Schroeder, *An Introduction to Thermal Physics*, 1st Edition, Addison Wesley Longman, 1999.

learningSystem/Blackboard: The course website is available on Blackboard and can be accessed through the myTrent portal. Announcements, lecture notes, assignments, solutions, and other supplemental course material will be posted on this website throughout the term. As such, it is recommended that you log on to check the learningSystem/Blackboard regularly.

Course Format:

Type	Day	Time	Location
Lecture	Tuesday	1:00-2:50 pm	SC 317
Lecture	Thursday	2:00-2:50 pm	SC 317

Learning Outcomes/Objectives/Goals/Expectations:

This course has been developed to address several learning outcomes. By the end of the course, a successful student should be able to:

1. Explain the Laws of Thermodynamics, and be able to apply these laws to solve a variety of quantitative problems.
2. Describe the principles of the equipartition theorem and the kinetic theory of gases.
3. Understand fundamental thermodynamic concepts such as heat, work, energy, and entropy.
4. Apply the principles of thermodynamics to analyze heat engines and refrigerators.
5. Use thermodynamic potentials to derive the fundamental thermodynamic relations, equations of state, and Maxwell relations.

Course Evaluation:

Type of Assignment	Weighting	Due Date
Quizzes	5%	~weekly
Assignments (x5)	30%	Jan. 24, Feb. 9, Mar. 2, Mar. 21, Apr. 4
Midterm	25%	February 14th
Final Exam	40%	April Exam Period

Quizzes (5%): There will be a series of eight to ten "mini-quizzes" held at the beginning of the two hour Tuesday lecture period. These quizzes will be approximately fifteen minutes long, and will consist of short questions based on class discussion or pre-class readings. Missed quizzes cannot be made up, but the two lowest quiz marks of the term will be dropped.

Assignments (30%): There will be five assignments due throughout the term, consisting of problems similar to those discussed in class or provided in the textbook. Assignments will be due at ~2 to 3 week intervals, and each assignment will be given equal weighting.

Midterm (25%): There will be a two hour long midterm examination held on Tuesday, February 14th, during the normal class timeslot (1:00-2:50 pm).

Final Exam (40%): There will a three hour long final examination for this course, which will be held during the April exam period. This exam will be cumulative, and may encompass any material covered from the beginning of the course.

Week-by-week schedule:

This course will primarily cover material from Chapters 1 to 5 in *An Introduction to Thermal Physics* by Schroeder. A schedule of topics is listed below:

- Energy, temperature, and thermal equilibrium (Ch. 1)
- The ideal gas model (Ch. 1)
- The equipartition theorem (Ch. 1)
- The first law of thermodynamics (Ch. 1)
- Heat and work (Ch. 1)
- Basic principles of statistical thermodynamics (Ch. 2)

- The second law of thermodynamics (Ch. 2)
- Entropy (Ch. 2 and 3)
- The third law of thermodynamics (Ch. 3)
- Mechanical equilibrium and pressure (Ch. 3)
- Diffusive equilibrium and chemical potential (Ch. 3)
- Heat engines and refrigerators (Ch. 4)
- Free energy and chemical thermodynamics (Ch. 5)
- Thermodynamic potentials and identities (Ch. 5)
- Phase transitions of mixtures, solutions, and pure substances (Ch. 5)

Although specific dates are not listed, I will follow the order of topics as given and will regularly communicate in class and on the learningSystem/ Blackboard about the pacing of the lectures. For this reason, it is important for you to attend class and log on to the learningSystem/ Blackboard regularly.

Department and/or Course Policies:

Midterms and Exams: Regardless of the final grade calculated using the marking scheme above, a weighted average of at least 40% must be obtained on the midterm and the final exam in order to pass this course. If this condition is not met, a final grade not exceeding 45% (F) will be assigned.

Late Policy: Marks will be deducted for late assignments at a rate of 10% per day (excluding weekends). Assignments will normally be accepted up to one week beyond the due date, after which a mark of zero will be assigned.

University Policies

Academic Integrity:

Academic dishonesty, which includes plagiarism and cheating, is an extremely serious academic offence and carries penalties varying from failure on an assignment to expulsion from the University. Definitions, penalties, and procedures for dealing with plagiarism and cheating are set out in Trent University's *Academic Integrity Policy*. You have a responsibility to educate yourself – unfamiliarity with the policy is not an excuse. You are strongly encouraged to visit Trent's Academic Integrity website to learn more: www.trentu.ca/academicintegrity.

Access to Instruction:

It is Trent University's intent to create an inclusive learning environment. If a student has a disability and documentation from a regulated health care practitioner and feels that he/she may need accommodations to succeed in a course, the student should contact the Student Accessibility Services Office (SAS) at the respective campus as soon as possible.